Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
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Allocation of Spectrum Below 5 GHz Transferred from Federal Government Use	)	ET Docket No. 94-32
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	)	

To: The Commission

COMMENTS OF THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED

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SUMMARY

The American Radio Relay League, Incorporated ("the League"), the national non-profit association of amateur radio operators in the United States, submits its comments in response to the Commission's Notice of Inquiry ("the Notice"), FCC 94-97, 59 Fed. Reg. 25589, released May 4, 1994. The Notice seeks information on potential applications for 50 MHz of spectrum that is being transferred immediately from Federal Government to private sector use, as per the requirements of the Omnibus Budget Reconciliation Act of 1993, Pub. L. No. 103-66, Title VI, §6001(a)(3), 107 Stat. 312.

That Act requires (1) the avoidance of excessive disruption of amateur operation on reallocated Federal Government frequencies; (2) a determination of the extent to which, in general, commercial users could share the frequencies to be reallocated with amateur radio licensees; and (3) substitution of proposed reallocation frequencies if the President determines that the reassignment will disrupt the existing use of a Federal Government band of frequencies by amateur radio licensees.

It was a distinct surprise to the League, in reviewing NTIA's Preliminary Spectrum Reallocation Report, to find that, of the 50 MHz proposed for immediate reallocation from Government use, fully 25 MHz is spectrum currently shared with amateurs. Furthermore, there is no indication of any finding or study, as required by statute, that the proposed reallocation of that 25 MHz for commercial use will be benign with respect to continued amateur occupancy of the band. It appears, therefore, that unless NTIA, in its final spectrum allocation report, identifies for FCC some alternatives for replacement spectrum for the Amateur and Amateur-Satellite Services, amateurs will simply have to share the allocations at 2300-2310, 2390-2400, and 2402-2417 MHz with whoever the Commission decides to permit to operate in that band.

This fait accompli is not, it is submitted, what Congress intended. At minimum, the Commission's obligation in this proceeding is to conduct a preclusion study with respect to amateur use of the band, and to determine the compatibility factors with respect to alternative commercial sharing partners to amateurs in the bands proposed for reallocation.

The Amateur-Satellite Service needs more than 2 MHz in this band, as do the other developing uses by amateurs. There is a distinct need for a primary allocation for weak-signal work within the 2300-2310 MHz segment; and there must be at least a 10-MHz wide segment for the Amateur-Satellite Service for downlink operation. The League does not believe that the NTIA's Preliminary Report provides any accommodation for existing and near-term future amateur occupancy of the candidate bands. In fact, FCC is being

given spectrum that is already significantly used by Part 15, 18 and 97 Services, and from time to time, by STA, by Part 74 and 78 licensees.

If the Commission intends to add non-government users to the 2390-2400 and 2402-2417 MHz bands, elevation of amateur status in those segments to at least co-primary with the added commercial users is the minimum necessary to protect existing, and near-term future amateur uses of the band, including wideband television, satellite, and data and analog linking, as well as the traditional and well-established weak signal operations at 2300-2310 MHz.

Therefore, the American Radio Relay League, Incorporated respectfully requests that the Commission insure, in identifying any additional services to be placed in this spectrum, benign accommodation of continued amateur occupancy of the 2300-2310 and 2390-2417 MHz segments.

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COMMENTS OF THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED

The American Radio Relay League, Incorporated ("the League"), the national non-profit association of amateur radio operators in the United States, by counsel, and pursuant to Section 1.415 of the Commission's Rules (47 C.F.R. §1.415) hereby respectfully submits its comments in response to the Commission's Notice of Inquiry ("the Notice"), FCC 94-97, 59 Fed. Reg. 25589, released May 4, 1994. The Notice seeks information on potential applications for 50 MHz of spectrum that is being transferred immediately from Federal Government to private sector use, as per the requirements of the Omnibus Budget Reconciliation Act of 1993, Pub. L. No. 103-66, Title VI, §6001(a)(3), 107 Stat. 312.[1] In response to the Commission's Inquiry, the League states as follows:

I. Introduction

1. Title VI of the Omnibus Budget Reconciliation Act of 1993 ("the Act") requires that the Department of Commerce identify 200 MHz of spectrum currently allocated for use by the Federal

[1] See also, the Conference Report, H.R. Rep. No. 103-213, 103rd Cong., 1st Sess. (1993).

Government, for transfer to the Federal Communications Commission (FCC) for use by non-Federal Government users. In response to the obligation contained therein, the Commerce Department, in its Preliminary Spectrum Reallocation Report ("the Report"),[2] designated an initial 50 MHz of spectrum to be transferred immediately, i.e., the bands 2390-2400 MHz, 2402-2417 MHz and 4660-4685 MHz.[3] The instant Notice seeks information on potential applications for these 50 MHz of spectrum.

2. The Act specifies that, in identifying the frequencies for reallocation, the Secretary of Commerce shall seek to avoid three adverse results: (i) serious degradation of Federal Government services and operations; (ii) excessive costs to the Federal Government and users of Federal Government services; and (iii) excessive disruption of existing use of Federal Government frequencies by amateur radio licensees. The Act specifies that the Secretary shall consider, in analyzing the benefits from a particular reallocation, "the extent to which, in general, commercial users could share the frequency with amateur radio licensees...".[4] Finally, as one of the five grounds for substitution or withdrawal of proposed reallocation frequencies, the Act lists the circumstances in which the reassignment will

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[2] NTIA Special Publication 94-27, February 1994.

[3] See National Telecommunications and Information Administration (NTIA) Special Publication 94-27, Feb. 1994.

[4] 47 U.S.C. § 923(c)(3)(C).

disrupt the existing use of a Federal Government band of frequencies by amateur radio licensees.[5] These three sections of the Act make it clear that particular care must be taken in the reallocation or redeployment of Government bands that are shared with the Amateur Radio Services, and that the intent of Congress was to avoid any commercial use of the bands which amateurs have shared with Government users by non-government stations that will have the effect of disrupting existing amateur operation.

3. To summarize the above, the Act requires (1) the avoidance of excessive disruption of amateur operation on reallocated Federal Government frequencies; (2) a determination of the extent to which, in general, commercial users could share the frequencies to be reallocated with amateur radio licensees; and (3) substitution of proposed reallocation frequencies if the President determines that the reassignment will disrupt the existing use of a Federal Government band of frequencies by amateur radio licensees.

II. Avoidance of Disruption of Amateur Licensees

4. The League's May 11, 1994 comments in response to Department of Commerce Docket No. 940231-4031, which sought comment on the Preliminary Spectrum Reallocation Report, pointed out that the National Telecommunications and Information Administration (NTIA) studied the potential disruption of the *existing* amateur use of Federal Government bands, but compared that existing use as

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[5] 47 U.S.C. § 924(b)(2)(E).

against *future* use of the frequencies by new non-Federal users. The effect of the proposed reallocation on existing amateur uses of the reallocated bands is but a portion of the relevant inquiry; as well, the importance of the reallocated spectrum to the near-term and long-term developmental plans of the amateur services, particularly for the amateur-satellite service should have been reviewed. Since any reallocation will, prima facie, be related to and will affect future amateur uses, not merely present ones, *future* spectrum requirements of amateur and other potential services necessarily must be considered. In this connection, the expanded needs for amateur use of 2300-2310 MHz, 2390-2400 MHz and 2402-2417 MHz bands in the near term must be considered.

III. Sharing Between and Among Commercial and Amateur Users

5. The Act requires a determination of the extent to which commercial users could share the frequencies to be reallocated with amateur radio licensees. There is no indication that NTIA has, to date, performed this study. It is assumed by the League that such a study cannot in fact be performed until the Commission has identified operational and technical characteristics of the candidate radio services in the instant proceeding. Confirmation of this appears in paragraph 9(a) of the Notice, wherein commenters are requested to include appropriate standards and operating rules for the services envisioned.[6] In addition, it is necessary to work

[6] It is noted that the Commission has already identified one concept for use of reallocated bands, which is an "Advanced Private Land Mobile Communications Service," which would include advanced

with the latest information concerning the present and projected uses of the bands by other services. Specifically, the study should recognize that any new applications would co-exist with current occupants, which include amateur, industrial, scientific and medical (ISM), and a growing number of unlicensed Part 15 devices. Given the limitations inherent in accommodating new users in a band already extensively used by amateurs, and for Part 15 and Part 18 devices, the Commission might consider recommending to NTIA that substitutes for the 2300-2310 and 2390-2400 and 2402-2417 MHz bands should be sought. In any event, a determination of the proper non-government uses of the band must await an analysis of the compatibility of proposed non-government additions to the band with existing amateur uses.[7]

IV. Current Amateur Uses

6. As requested at paragraph 10 of the Notice, these comments will focus on bands proposed for immediate reallocation, specifically 2390-2400 MHz and 2402-2417 MHz. The League has no

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wireless imaging and decision processing/remote file access systems. The Commission has consolidated in this proceeding a petition filed jointly by the Coalition of Private Users of Emerging Multimedia Technologies (COPE). If the Commission is considering potentially extensive, high duty cycle uses such as land mobile operation, the need to determine the extent to which such use is compatible with satellite downlink operation, weak-signal communications and other amateur mobile uses becomes acute.

[7] There is a possibility of volunteer coordination between licensed commercial users and amateurs, even where there is mobile use by both, or mixed fixed and mobile uses. However, the fundamental ability of amateurs to continue to use the reallocated bands at all is dependent largely on the characteristics of the commercial services to be added to the bands.

comment on uses of the band 4660-4685 MHz, as the latter is not allocated to the amateur services, other than to note that any high-duty cycle uses that the Commission proposes should be confined to this segment, and not to the 2390-2450 MHz or 2402-2417 MHz segments, thus to avoid conflicts with existing amateur operation there.

7. Unlike most other radio services, amateur stations are not assigned to specific operating frequencies. They may select an appropriate operating frequency, within any authorized amateur band, for a given communication or experiment. One inherent effect of this operational flexibility is that there is no FCC database that purports to show the extent of amateur activity on a given frequency or band of frequencies at a particular time, and the Commission does not do band occupancy studies using normal engineering methods. Such databases exist only within some groups of the Amateur Radio Service itself. These are typically specialized by user interest, and are evolving and incomplete at any one point in time.

8. Since February of this year, the League has attempted to develop a more complete picture of the extent of existing and planned activity by amateurs in the 13-cm band. While the data remains incomplete, the following usage is known:

> **A. Amateur Television (ATV).** Television transmission often requires wider bandwidths than do other forms of amateur communication. For that reason, amateur television experimenters have an especially strong incentive to use the higher-frequency bands such as 2.4 GHz. Amateurs transmit both AM and FM video in this band. AM video has a bandwidth of approximately 6 MHz, and FM video has a bandwidth of approximately 17 MHz.

The use of the band for amateur television has been reported in eight states, and particularly in the Chicago area, northern and southern California, Arizona and Nevada. The use of FM equipment is prevalent because of its availability and signal quality. Information about such operation is not generally in the ARRL Repeater Directory because it is not of interest to traveling amateurs; hence, the absence of a centralized database of television operation.

In northern California, television repeaters are in operation and more are planned with outputs at 2428-2434 MHz. The Chief of Police of Martinez, California, Jerry Boyd, has described the importance of this repeater network to public safety in separate comments. As the network expands to provide more uniform coverage, the use of additional frequencies down to 2410 MHz will be required.

In southern California and in Nevada, television repeaters are in operation using FM video with inputs at 2433-2450 MHz (with a center frequency of 2441.5 MHz). Another channel at 2409-2426 MHz (with a center frequency of 2417.5 MHz) is used to link repeaters, and will be used more heavily in the future by equipment that is under construction now. In Arizona, the organization "Arizona Amateurs on TV" reports that it plans to link television repeaters in the Phoenix and Tucson areas on 2400 MHz FM.

B. Linking. Significant amateur use of 2.3-2.45 GHz for point-to-point linking is reported in California, Nevada, Arizona and Oklahoma. It is particularly difficult to document amateur linking, because the operators of links tend to avoid publicizing their existence: other amateurs have no need for or access to the links themselves, but rather utilize the data or analog stations linked together, and so the links are not listed in directories, other than perhaps by one of the more than 50 volunteer frequency coordinators in the United States. Transmission and reception from one site simultaneously normally involves using different frequencies and polarizations to increase the isolation between the transmitter and receiver. In this regard, some operators report that it would be difficult to compensate for the loss of the 2300-2310 MHz band segment, since the required degree of frequency separation would not be available between 2417 and 2450 MHz. The 2400-2402 MHz segment would not be available for this purpose, because of the requirements of the Amateur-Satellite Service.

New technology developed for Part 15 use in the 2400-2483.5 MHz band appears eminently suitable for certain amateur applications, including high-speed data linking. It is expected that, as this technology becomes readily available at reasonable prices, the use of the band by amateurs for fixed links will increase dramatically.[8]

C. Weak signal operation. There are more than 200 stations in the United States which have most recently reported active operation at or near the frequency of 2304.1 MHz. These amateurs are engaged primarily in the study of unusual over-the-horizon media, such as tropospheric ducting and other propagation phenomena. The terrestrial distance record for communication between amateur stations in this band is 1,512 km., between Texas and Michigan. At least four stations in the U.S. have managed to establish contact by reflecting their signals off the surface of the moon (Earth-moon-Earth, or EME, communication). The popularity of this activity has increased significantly in recent years, as it has become increasingly easier to building equipment capable of the high performance that weak-signal operation requires. Typically, narrow bandwidths (3 kHz or less) are used. If weak-signal operation were to be moved to another part of the band, above 2390 MHz, a significant existing investment in equipment and antennas, using post-tax dollars, would be lost. To be suitable, the new frequencies would have to be free of signals that would cause interference of long duration to sensitive, narrow-bandwidth receivers and could not require protection from amateur transmitters using relatively high effective radiated powers (in excess of 40 dBW).

D. Amateur Satellite Operation. The NTIA preliminary report excludes the band 2400-2402 MHz from the proposed frequencies to be reallocated. That segment is currently occupied by amateur satellites. However, that segment alone does not provide sufficient bandwidth to meet near-term future amateur satellite requirements, nor does it satisfy the need to have comparable spectrum for uplinks and downlinks. The band 144-146 MHz is allocated to the Amateur Service and the Amateur-Satellite Service. Terrestrial amateur uses occupy most of the band, leaving

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[8] This is especially true in the near term, inasmuch as a number of fixed links were displaced from the 220-222 MHz segment when that band was reallocated to the Land Mobile services. Those links could not be reaccommodated in the residual 222-225 MHz segment; the 420-450 MHz band is saturated in many metropolitan areas, and the 902-928 MHz band is not reliable for fixed links given the allocation situation there.

the band 145.8-146.0 MHz (200 kHz) for amateur-satellite use. This band is generally paired with the band 435-438 MHz (3 MHz wide). On this assumption, the remaining 2.8 MHz of the 435-438 MHz band used for satellite operation would be paired with an equal bandwidth segment in the next higher amateur-satellite band, 1260-1270 MHz (a 10-MHz wide band limited to the Earth-to-space direction). This would leave 7.2 MHz of the 1260-1270 MHz band to be paired with an equal amount starting at 2400 MHz. Unfortunately, the NTIA Preliminary Report has designated only 2 MHz (2400-2402 MHz) below 2417 MHz to be retained under government control, which is insufficient protection for the needs of the Amateur-Satellite Service.

To accommodate amateur-satellite operation, some spectrum around 2400 MHz is needed for pairing with the next higher amateur-satellite allocation of 3400-3410 MHz (in Regions 2 and 3 only) or with the band 5650-5670 MHz, which is restricted to the Earth-to-space direction.[9] While it is not necessary that uplink and downlink bandwidths be exactly equal, a 2 MHz wide band at 2400 MHz, and 10 MHz wide bands below and above do not provide balanced uplinks and downlinks; the reservation of 2400-2402 MHz is therefore insufficient by a wide margin as a means of protecting the Amateur-Satellite Service, and a larger segment should be reserved for that reason. The comments in this proceeding of the Radio Amateur Satellite Corporation (AMSAT) are particularly expansive on this point, and should be given serious consideration by the Commission in this proceeding.

V. Near-Term Future Amateur Needs at 2.3-2.4 GHz

9. The League submitted detailed spectrum requirements of the Amateur Service in NTIA Docket No. 920532-2132, "Current and Future Requirements for the Use of Radio Frequencies in the United States." At that time, the League stated as follows:

> There are more than 580,000 licensed amateur radio operators in the United States and an estimated 2.4

[9] The band 5.830-5.850 GHz is authorized for amateur-satellite service use in the space-to-earth direction, but it is secondary in all ITU Regions and cannot interfere with fixed satellite use in ITU Region 1.

> million licensed amateurs worldwide. Within the United States, the annual growth rate was 4.8%, but since the introduction of a class of license not requiring proficiency in Morse code, the rate has increased to its present level of 8.7%. Worldwide, the number of amateurs is growing at a rate of 7%.

Since those comments were filed, the U.S. licensed amateur population has grown to more than 632,000 licensees, and the growth rate for the entire year 1993 was 7.48%. Growth is significant here, not only because the need for amateur spectrum is at historically high levels, but also because the number of users of amateur allocations at frequencies at and below 2450 MHz has increased radically. The Commission has recently noted to Congress the significant increase in the number of licensed amateurs. Indeed, the most significant growth is in the license classes which authorize VHF, UHF and microwave amateur operation exclusively.

10. In most radio services, including the Amateur Radio Service, the general pattern is to saturate lower-frequency bands before moving to the next higher one. Two reasons for upward frequency migration are that lower-frequency signals tend to propagate farther without relay, and initial equipment costs are greater when occupying a higher-frequency band. Recent increases in amateur operation at 2300-2450 MHz reflect both the saturation of lower allocations and the availability of microwave equipment for amateur use. The Amateur Radio Service has mature usage of its bands below 1 GHz; it is rapidly developing the 1240-1300 MHz band; and it is early in the development of the 2300-2310 MHz and 2390-2450 MHz bands. The trend is nevertheless clear: These bands are

needed for the expansion of existing uses and innovative experiments within the Amateur Radio Service over the next decade.

11. It is also noteworthy that the continued availability of the entire 2300-2310 and 2390-2450 MHz segments have been touted by the Commission as a basis for reallocation of other spectrum allocations. The Amateur Service has had withdrawn from its use most recently the bands 220-222 MHz, 420-430 MHz in the northern United States, and 2310-2390 MHz. It stands to lose significant access to 902-928 MHz as the result of proposed service rules changes in Part 90.[10] The Commission's expressed rationale is the assumption that other existing allocations, (including 2300-2310 and 2390-2450 MHz) will continue to be available to amateurs, and therefore reallocation or dilution of the utility of a particular band to amateurs is therefore justified. This argument has been utilized twice recently: in Docket 87-14, in which the FCC, based in large part on the assertion that the reallocation represented a minute percentage of available alternative spectrum for short-range communications, removed 220-222 MHz from amateur use; and in Docket 93-61, in which the FCC has proposed to expand Automatic Vehicle Monitoring operation to encompass the entire 902-928 MHz band, thus decreasing the utility of that allocation for amateur and other ongoing uses. However, the argument of alternative spectrum fails

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[10] The Commission's proposal in Docket 93-61, now pending, would result in expansion of the frequency availability within the 902-928 MHz band for Automatic Vehicle Monitoring facilities, and at the same time expand the concept of AVM to include location of objects. See, the Notice of Proposed Rule Making, FCC 93-141, 8 FCC Rcd. 2502 (1993), amended by erratum, DA 93-516, 8 FCC Rcd. 3233 (1993).

as a matter of logic after the first use of the argument. The FCC has held out the 2300-2310 MHz and 2310-2390 MHz bands as being available, though it has reallocated 220-222 MHz and 420-430 MHz (in certain geographical areas); proposed to diminish amateur use of 902-928 MHz; and it has reallocated 2310-2390 MHz for aeronautical flight test telemetry use. Diminution of the utility of amateur access to 2300-2310 and 2390-2450 MHz by addition of considerably less compatible sharing partner than current Government uses would constitute a breach of faith with the Amateur Services after FCC encouraged reliance on the continued availability of those allocations in its prior proceedings.

VI. Comments on Specific Issues Invited by the Notice

12. The Notice, at paragraph 9, requests comments on specific issues relating to the usefulness of the reallocated bands for private sector use. These are as follows:

> a) Does the spectrum identified for immediate reallocation have potential for promoting economic growth and competition and enhancing access to services when used in the private sector and, if not, why? What would be the most appropriate non-Federal uses of these bands? Commenters should describe services envisioned for these bands, including appropriate standards and operating rules.

For the reasons contained in these comments, it is apparent that the bands identified in the Preliminary Report of NTIA at 2300-2310, 2390-2400, and 2402-2417 MHz do not, because of the present and future allocation needs of the Amateur Radio Service, offer significant opportunity for occupancy by new technologies which promote economic growth and competition. It is fair to say that

NTIA has preliminarily identified for reallocation bands which the Commission is already using for at least Part 15, 18 and 97 Services, and, on STA basis, Part 74 and 78 licensees. The choice of frequency bands by NTIA in this instance, making allowances for the difficult choices facing NTIA in the process, was certainly not optimum. Arguably, because of the inordinately large amount of amateur-shared spectrum proposed for reallocation that is in the protected class identified by Congress, NTIA's choice of 2.3-2.417 GHz was uniquely inappropriate and unsuitable, given the standards set forth by Congress to avoid adverse impact on amateur uses. In this respect, the League specifically disagrees with NTIA that the amateur community "can satisfy the majority of their (sic) spectrum requirements in the 13 cm band in the remaining 35 MHz.[11]

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[11] Industrial, scientific and medical (ISM) applications centered at 2450 MHz radiate energy over the entire 2400-2500 MHz band. While ISM equipment has variable characteristics, the power of such devices tends to be greater near the center frequency and decreases with increasing frequency separation. Studies conducted by the National Space and Aeronautics Administration (NASA) for the Voice of America (VA) in preparation for WARC-92 took this into account and led the United States to seek a broadcasting-satellite service (BSS)(sound) allocation at 2310-2360 MHz rather than other options closer to 2450 MHz. Of particular concern was the widespread use of domestic microwave ovens, many of which would be located in close proximity to BSS (sound) receivers in homes. The FCC WARC-92 Industry Advisory Committee sub-group concerned with identifying new candidates for mobile-satellite service (MSS) allocations studied potential interference from ISM and decided to avoid the 2450 MHz ISM center frequency to the extent possible.

Part 15 of the FCC Rules permits use of the 2400-2483.5 MHz band by unlicensed low-power devices. A typical local area network system uses spread spectrum and can produce an elevated noise level throughout the 2400-2483.5 MHz band. As a result of the prevalence of ISM and Part 15 devices, the amateur service considers its existing allocations at 2300-2310 MHz and 2390-2400 MHz to be far more usable from an interference viewpoint than those in the 2400-2450 MHz range. Other potential users of the 2300-2450 MHz band

13. Nonetheless, assuming that NTIA's preliminary reallocation report is not modified when final reallocation decisions are made, the Amateur Service can share portions of the 2300-2310, 2390-2400, and 2402-2417 MHz segments with certain types of commercial users. Most amateur operation occurs in residential areas, or proximate to residential areas, with current uses principally in metropolitan areas near cities and suburbs. The simplest type of commercial use to accommodate in these allocations would be licensed terrestrial point-to-point stations, or services not routinely located in or proximate to residential areas. Services with low duty cycles would be more likely to avoid interference to and from amateur operation

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would prefer spectrum closer to 2300 MHz than to 2450 MHz. Though NTIA's proposed reallocation of the 2300-2310 MHz, 2390-2400 MHz and 2402-2417 MHz bands to the FCC for non-government use does not in itself deny these frequencies to the amateur service; and while NTIA retains control of the bands 2400-2402 MHz and 2417-2450 MHz, which coincidentally provides some protection for the amateur services while simultaneously protecting some government systems in these bands, these actions set the stage for the amateur services having access only to 2400-2402 MHz and 2417-2450 MHz, after the Commission's implementation of the allocations and assignment of licenses to non-Government users in the reallocated bands. The 2400-2402 MHz band, reserved for Government and existing amateur-satellite use, is sufficiently removed from the ISM center frequency of 2450 MHz to be relatively free of ISM interference. The 2417-2450 MHz segment is not the most desirable portion of the 2390-2450 MHz band. Thus, NTIA's cavalier reference to the "remaining 35 MHz" available to amateurs, with Government users on the same cooperative basis as before, is misleading: the segment above 2417 MHz is the least desirable of the 70 MHz that is presently available to amateurs on a shared basis with Government users at 2300-2450 MHz. The League believes this inequitable in the extreme; the Amateur Services have legitimate needs for continued access to a significant portion of the 2300-2310 MHz segment for ongoing terrestrial weak-signal experimentation and other uses, and for continued access to significant portions of the 2390-2417 MHz segment for a variety of uses, including an amateur-satellite downlink band on the order of 10 MHz wide.

in the same bands, and digital operation would be preferred over analog technologies. Wide bandwidth and spread-spectrum uses are particularly suitable to sharing with amateur operation in these segments.

14. The Notice next asks:

> b) What, if any, restrictions should be placed on uses of these bands, including any restrictions that may be necessary to protect operations on adjacent or harmonically-related spectrum? In considering the use of the 2390-2400 MHz band, commenters should discuss the necessity of the limitations suggested by the Department of Commerce for non-Federal use of this band. Commenters should also consider the effect that such restrictions will have on competition and on access to new services.

Among the limitations that should be placed on any new non-government services to be permitted in the 2300-2417 MHz segments to share with amateur users is the obligation of any commercial user to avoid any interference to international amateur operations. The International Telecommunication Union (ITU) Radio Regulations allocate the band 2300-2450 MHz to the amateur service on a secondary basis and the band 2400-2450 MHz to the amateur-satellite service in accordance with footnote 664. Most administrations have implemented the entire amateur service 2300-2450 MHz secondary allocation. Some countries have given amateurs access only to part of the band. The proposed reallocation raises the distinct possibility that the actions of individual countries will result in a crazy-quilt pattern. This would make it difficult for international amateur communications in the band, which consist of satellite, Earth-Moon-Earth and terrestrial circuits using tropospheric propagation anomalies. For the amateur service to

retain its traditional capability of intercommunication without regard to international borders, some commonality of allocations is required. In countries in which the entire band is not implemented, the frequency segments do not necessarily agree. Within Europe, however, the Conference of Posts and Telecommunications (CEPT) has begun an effort toward "harmonization" of all frequency allocations, including the amateur bands. Whether the eventual CEPT allocation will be the same as the U.S. allocation to amateurs is unknown at this time. If change in the 2300-2450 MHz amateur band is inevitable, it would be desirable for the U.S., CEPT and Japan to agree upon overlapping allocations. Domestically, however, it is necessary for the Commission to protect non-U.S. amateur use of the entire 2300-2310 MHz and 2390-2417 MHz allocation, and the amateur-satellite use of 2400-2417 MHz.

15. Paragraph 9(c) of the Notice asks whether the proposed reallocation will avoid excessive disruption of existing use of the Federal Government frequencies by amateur service licensees, and whether the exclusion of the 2400-2402 MHz segment is sufficient to avoid disruption of existing amateur-satellite operations. The first part of the question, of course, is unanswerable without an indication of the new sharing partner proposed by the Commission. The inability of the League, or any amateur representative, to respond to such a question in the abstract is precisely the basis for the statutory obligation of the Commission and the Commerce Department to study the compatibility of amateur operation and commercial operation, generally in any reallocated segment. Given

the apparent interest in the 2300-2450 MHz band by land mobile entities such as CORE, for example, it is not at all clear that amateur operation in the reallocated segments can avoid disruption. Alternative frequency bands for immediate reallocation should be considered.

16. As to the second portion of the paragraph 9(c) inquiry, the AMSAT comments sufficiently establish that the reservation of 2400-2402 MHz segment by NTIA is necessary, but not sufficient to protect amateur-satellite operation. As noted in part by AMSAT:

> As the Commission notes, the NTIA excluded 2400-2402 MHz from the proposed reallocation. These frequencies are of vital importance to spacecraft operations in the amateur-satellite service, for satellites in current use as well as those under consideration. However, in the readily foreseeable future, AMSAT anticipates greatly increased demand for amateur-satellite operations in that portion of the spectrum, far more than can reasonably be accommodated within a 2 MHz band. It is certainly too restricted to accommodate such wideband techniques as fast-scan television, even if compression techniques are employed. AMSAT hopes to be able to employ such modes on future spacecraft. The 10 MHz wide 1260-1270 MHz uplink-only amateur-satellite service allocation is available for such applications, and a similar bandwidth is needed as a paired downlink near 2400 MHz.
>
> AMSAT comments, at 3.

In this connection, it is important to recognize that under ITU regulations, the lowest available frequency range for amateur satellite downlinks above 438 MHz is at 2400-2450 MHz. The amateur-satellite service allocation at 1260-1270 MHz is designated for use for uplinks only. The next higher amateur-satellite band above 2450 MHz is not available worldwide, and therefore is not likely to be used for amateur satellites unless a worldwide allocation could somehow be obtained. Due to economic and technical considerations,

AMSAT predicts that the 2400 MHz band will bear the greatest burden of supporting the growth of the amateur-satellite service in the next ten to twenty years.[12] This cannot be accomplished, however, in only 2 MHz of available spectrum. Accordingly, and for the reasons stated elsewhere herein, the 2 MHz excluded from reallocation is useful and appreciated by the Amateur Service, but it is hardly sufficient to avoid disruption of amateur-satellite use of the band.

17. The Notice next asks, at paragraph 9(d), as follows:

> d) Will new non-Federal services in these bands be able to share the spectrum with existing services, especially with amateur operations in the 2390-2400 MHz and 2402-2417 MHz bands, and with the fixed-satellite service in the 4660-4685 MHz band? If yes, what are the appropriate sharing criteria? What should be the relative status of users? What effect will existing users have on competition and on access to new users?

The comments herein generally respond to this inquiry. The importance of the 2390-2400 MHz and 2402-2417 MHz segments to amateurs is principally in the near future, and the sharing opportunities between amateurs and commercial services depend largely on the Commission's crafting a sharing plan which will permit orderly growth of amateur use of the bands at the same time that non-government users are permitted access as well. The

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[12] It is important to recognize that planning for amateur satellite operation, due to the tremendous costs involved, require planning in the ten-year time frame routinely. There are extensive plans for new amateur satellites, which require the availability of spectrum in the 2400 MHz vicinity. The Commission must be sensitive to the private financial obligations of those involved in satellite planning and construction, and avoid rendering the plans and commitments of AMSAT and others a nullity by imprudent allocations decisions.

Commission is obligated to conduct detailed compatibility studies after identifying candidate commercial users. However, an opportunity exists in this proceeding to both protect amateur uses and encourage orderly development of the band, by elevating amateur use of 2390-2400 MHz and 2402-2417 MHz to primary status. This, coupled with creation of a primary segment for amateur weak-signal work within the 2300-2310 MHz segment will provide for reasonable development of amateur use of the band, and insure that amateur occupancy will not be disrupted by the addition of another layer of non-government users. In order to "promote competition and access to new services", and to insure that amateur use of the bands on a primary basis does not preclude new users, the League would not object to such non-government uses being given co-primary allocation status. And, as mentioned above, the League is willing to coordinate amateur use with other co-primary users in the shared bands. What must be avoided, however, is a situation in which amateurs are relegated to secondary status, while new users, especially land mobile users, are given primary status in the band. That situation occurred in the 902-928 MHz band in some areas of the country, when AVM systems were developed. Amateurs were simply told by the AVM "newcomer" to cease operation in the entire band, in favor of the primary user. To allow that to occur at 2390-2417 MHz would be to disaccommodate amateurs completely, contrary to Congress' specific instructions.

18. The League has no specific comment on items 9(e), (f), and (g), as these do not relate specifically to amateur use of the

bands at issue. In item 9(h), however, the Commission asks whether it would be useful to delay any licensing in the 2390-2400 MHz segment until, in two years, the 2300-2310 MHz segment becomes available for pairing of frequencies. Reference is made at footnote 26 of the Notice to the obligation of the Commission to auction at least 10 MHz of transferred spectrum not longer than five years after the date of enactment of the Omnibus Budget Reconciliation Act. This is of great concern to the Amateur Service, due to the firmly established weak-signal segment at 2304 MHz. If the Commission intends to auction spectrum, it would be disastrous to auction spectrum shared with the Amateur Service, as there would effectively be no protection for the most sensitive of all amateur uses at 2.3-2.45 GHz against interference. Unless the Commission were to exclude a segment at or near 2304 MHz (such as 2303-2305 MHz) for amateur weak-signal operation, there cannot be said to be any protection against disruption of the band. The segment at and near 2304 MHz is perhaps the heaviest used portion of the band by amateurs at the present time. It would indeed be useful to delay any licensing of commercial users in the 2390-2400 MHz band, but not so that paired channels can be assigned together with the 2300-2310 MHz segment; rather, it would permit a more reasonable study to be conducted of amateur/commercial sharing in those segments, as mandated by Congress.

VII. Conclusions

19. The Amateur Service was specifically provided protection by Congress in the Omnibus Budget Reconciliation Act. Three distinct obligations were specified by Congress for NTIA to follow in considering which bands to reallocate for non-government use, in order to protect amateur use of shared bands. It was a distinct surprise to the League, therefore, in reviewing NTIA's Preliminary Spectrum Reallocation Report, to find that, of the 50 MHz proposed for immediate reallocation from Government use, fully 25 MHz is shared with amateurs. Furthermore, there is no indication of any finding or study, as required by statute, that the proposed reallocation of that 25 MHz for commercial use will be benign with respect to continued amateur occupancy of the band. It appears, therefore, that unless NTIA, in its final spectrum allocation report, identifies for FCC some alternatives for replacement spectrum for the Amateur and Amateur-Satellite Services, amateurs will simply have to share the allocations at 2300-2310, 2390-2400, and 2402-2417 MHz with whoever the Commission decides to permit to operate in that band. This fait accompli is not, it is submitted, what Congress intended. At minimum, the Commission's obligation in this proceeding is to conduct a preclusion study with respect to amateur use of the band, and to determine the compatibility factors with respect to alternative commercial sharing partners to amateurs in the bands proposed for reallocation.

20. The Amateur-Satellite Service needs more than 2 MHz in this band, as do the other developing uses by amateurs. There is a